LISTING OF CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) In a management application, a method for applying a management action to a resource, the method comprising:

receiving a selection of a resource representation in a network environment that represents a resource to which a management action is to be applied;

applying a series of resource traversal functions to a repository containing objects representative of network resources in the network environment, the traversal functions identifying a set of action affected resources in the network environment existing along a set of relationship paths extending to at least one storage device that have a current allocation relationship to the selected resource, by:

applying a going down function to the repository containing objects representative of resources to identify a set of downward resources in the network environment that have a downward allocation relationship to the selected resource, the downward allocation relationship indicating resources that the selected resource depends upon and that are in operational use during access to data by the selected resource on a downward allocation path beginning at the selected resource and extending downward through the network environment and terminating at physical storage devices that store the data accessed by the selected resource, by:

identifying existence of a set of replicated resources in the set of downward resources, the set of replicated resources including a replicated instance of a detected replicated resource and any resources operationally related to the replicated instance of the detected replicated resource; and

presenting a representation of the set of action affected resources in the network environment to a user of the management application, the representation of the set of action affected resources informing the user of resources within the storage area

network that are currently in an functional relationship with the selected resource to which a management action is to be applied and that may be affected if the management action is to be applied to the selected resource.

2.   (Canceled)

3.   (Currently Amended) The method of claim [[2]]1 wherein applying the going down function comprises:

~~identifying existence of a set of replicated resources in the set of downward resources, the set of replicated resources including a replicated instance of a detected replicated resource and any resources operationally related to the replicated instance of the detected replicated resource;~~

in response to identifying existence of the replicated resource:

prompting a user to determine if the set of replicated resources are to be included in the application of the series of resource traversal functions;

receiving a replication response from the user;

if the replication response from the user indicates the set of replicated resources are to be included in the application of the series of resource traversal functions, then applying the series of resource traversal functions to the set of replicated resources.

4.   (Original) The method of claim 2 wherein applying a series of resource traversal functions comprises:

applying a going up function to the repository containing objects representative of resources to identify a set of upward resources in the network environment that have an upward allocation relationship to the selected resource, the upward allocation relationship indicating resources that depend upon operational use of resources in the set of downward resources but that exist on an upward allocation path beginning at the physical storage devices that store the data accessed by the selected resource as identified in the set of downward resources and extending upward through the network

to top-level resources comprising at least one host device resource other than host device resources identified in the set of downward resources.

5.   (Original) The method of claim 4 wherein applying a going up function comprises:

   determining if alternate host resources exist, the alternate host resources including any host device resources of host computer systems other than a host computer system containing the selected resource share data allocated on any storage device resources identified during application of the going down function for the selected resource, and if alternate host resources exist:

      prompting a user to determine if the alternate host resources are to be included in the application of the going up and closure resource traversal functions;

      receiving a multiple-host response from the user;

      if the multiple-host response from the user indicates the alternate host resources are to be included in the application of the going up and closure resource traversal functions, then including the alternate host resources in application of the going up and closure resource traversal functions.

6.   (Original) The method of claim 4 wherein applying a series of resource traversal functions comprises:

   applying a closure function to the repository containing objects representative of resources to identify a set of closure resources in the network environment that have an indirect relationship to any resources in the set of upward and downward resources, the set of closure resources indicating resources that would be affected by a change made to operation of resources.

7.   (Original) The method of claim 6 wherein applying a series of resource traversal functions including the going down function, the going up function and the closure function comprises:

identifying a collective set of action-affected resources that relate to operation of the selected resource and include the set of downward resources, the set of upward resources and the set of closure resources on data flow paths within the network environment.

8.   (Original) The method of claim 7 comprising:

receiving a final selection of resource representations in the network environment that represent resources to which a management action is to be applied, the final selection being made from the collective set of action-affected resources that relate to operation of the selected resource; and

applying the management action to the final selection of resource representations.

9.   (Original) The method of claim 8 wherein receiving a final selection of resource representations comprises:

determining if any resources selected from the final selection of resource representations in the network environment are resources identified within the set of closure resources in the network environment, and if so, performing the operations of:

re-applying the series of resource traversal functions including the going down function, the going up function and the closure function to any selected top-level any resources selected from the final selection of resource representations in the network environment are resources identified within the set of closure resources; and

re-selecting a final selection of resource representations in the network environment that represent resources to which a management action is to be applied.

10.   (Original) The method of claim 8 wherein the management application is a storage management application and the management action is deallocation of

resources that operate to store data under management of the management application.

11.   (Original) The method of claim 10 wherein:

objects representative of resources in the network environment in the repository are hierarchically arranged in an order and include host objects representing host resources and storage objects representing storage resources in allocated by the host resources and where the host objects are hierarchically above the storage objects in the hierarchically arranged order; and

wherein the selected resource representation corresponds to a host object resources; and

wherein applying the going down function comprises:

traversing operational relationships of host objects, beginning at the selected resource host object in the repository, to identify successive host and storage objects linked in an operational path ending at at least one storage object that is a storage device, the going down function thus identifying each host and storage resource allocated for use during access to data in the storage device object by the selected host object resource.

12.   (Previously Presented) The method of claim 11 wherein applying the going up function comprises:

identifying host objects in the repository that are:

i) operationally linked to each host and storage object identified during application of the going down function but in a direction upwards in the hierarchically arranged order of objects in the repository; and

ii) not directly within the data flow path identified in the going down function from the selected resource host object to the storage device object, the going up function thus identifying additional objects representing resources in the network environment that may be affected by the management action upon the selected resource.

13.   (Original) The method of claim 12 wherein applying the closure function comprises:

identifying closure objects in the repository by repeatedly re-applying an operation of the going down function and going up function to the additional objects representing resources in the network environment that may be affected by the management action upon the selected resource that were identified during operation of the going up function.

14.   (Original) The method of claim 13 wherein hierarchically arranged host objects include a top-level host computer system, a database, a file system, a volume group, a logical volume, a multipath device, a host interface device, a host port; and

wherein hierarchically arranged storage objects include a lowest-level storage device, a storage adapter, and a storage port.

15.   (Currently Amended) A computer system comprising:

a memory;

a processor;

a display;

a repository;

an interconnection mechanism coupling the memory, the processor, the display and the repository; and

wherein the memory is encoded with a management application including a resource manager application that, when executed on the processor, provides a management process that includes a resource manager that applies a management action to a resource by performing, in the computer system, the operations of:

receiving, via a graphical user interface on the display, a selection of a resource representation in a network environment that represents a resource to which a management action is to be applied;

applying a series of resource traversal functions to the repository containing objects representative of network resources in the network environment, the traversal

functions identifying a set of action affected resources in the network environment existing along a set of relationship paths extending to at least one storage device that have a current allocation relationship to the selected resource, by:

    applying a going down function to the repository containing objects representative of resources to identify a set of downward resources in the network environment that have a downward allocation relationship to the selected resource, the downward allocation relationship indicating resources that the selected resource depends upon and that are in operational use during access to data by the selected resource on a downward allocation path beginning at the selected resource and extending downward through the network environment and terminating at physical storage devices that store the data accessed by the selected resource, by:

        identifying existence of a set of replicated resources in the set of downward resources, the set of replicated resources including a replicated instance of a detected replicated resource and any resources operationally related to the replicated instance of the detected replicated resource; and

    presenting a representation of the set of action affected resources in the network environment to a user of the management application, the representation of the set of action affected resources informing the user of resources within the storage area network that are currently in an functional relationship with the selected resource to which a management action is to be applied and that may be affected if the management action is to be applied to the selected resource.

16.   (Canceled)

17.   (Currently Amended) The computer system of claim [[16]]15 wherein when the resource manager performs the operation of applying the going down function, the resource manager performs the operations of:

    ~~identifying existence of a set of replicated resources in the set of downward~~

~~resources, the set of replicated resources including a replicated instance of a detected~~
~~replicated resource and any resources operationally related to the replicated instance of~~
~~the detected replicated resource;~~

in response to identifying existence of the replicated resource:

prompting a user to determine if the set of replicated resources are to be included in the application of the series of resource traversal functions;

receiving a replication response from the user;

if the replication response from the user indicates the set of replicated resources are to be included in the application of the series of resource traversal functions, then applying the series of resource traversal functions to the set of replicated resources.

18.   (Original) The computer system of claim 16 wherein when the resource manager performs the operation of applying a series of resource traversal functions, the resource manager performs the operation of:

applying a going up function to the repository containing objects representative of resources to identify a set of upward resources in the network environment that have an upward allocation relationship to the selected resource, the upward allocation relationship indicating resources that depend upon operational use of resources in the set of downward resources but that exist on an upward allocation path beginning at the physical storage devices that store the data accessed by the selected resource as identified in the set of downward resources and extending upward through the network to top-level resources comprising at least one host device resource other than host device resources identified in the set of downward resources.

19.   (Original) The computer system of claim 18 wherein when the resource manager performs the operation of applying a going up function, the resource manager performs the operations of:

determining if alternate host resources exist, the alternate host resources including any host device resources of host computer systems other than a host

computer system containing the selected resource share data allocated on any storage device resources identified during application of the going down function for the selected resource, and if alternate host resources exist:

        prompting a user to determine if the alternate host resources are to be included in the application of the going up and closure resource traversal functions;

        receiving a multiple-host response from the user;

        if the multiple-host response from the user indicates the alternate host resources are to be included in the application of the going up and closure resource traversal functions, then including the alternate host resources in application of the going up and closure resource traversal functions.

20.   (Original) The computer system or claim 18 wherein when the resource manager performs the operation of applying a series of resource traversal function, wherein when the resource manager performs the operation of:

applying a closure function to the repository containing objects representative of resources to identify a set of closure resources in the network environment that have an indirect relationship to any resources identified by going down and going up, the set of closure resources indicating resources that would be affected by a change made to operation of original resources.

21.   (Original) The computer system of claim 20 wherein when the resource manager performs the operations of applying a series of resource traversal functions including the going down function, the going up function and the closure function, the resource manager performs the operation of:

identifying a collective set of action-affected resources that relate to operation of the selected resource and include the set of downward resources, the set of upward resources and the set of closure resources on data flow paths within the network environment.

22.   (Original) The computer system of claim 21 wherein the resource manager performs the operations of:

receiving a final selection of resource representations in the network environment that represent resources to which a management action is to be applied, the final selection being made from the collective set of action-affected resources that relate to operation of the selected resource; and

applying the management action to the final selection of resource representations.

23.   (Original) The computer system of claim 22 wherein when the resource manager performs the operation of receiving a final selection of resource representations, the resource manager performs the operations of:

determining if any resources selected from the final selection of resource representations in the network environment are resources identified within the set of closure resources in the network environment, and if so, performing the operations of:

re-applying the series of resource traversal functions including the going down function, the going up function and the closure function to any selected top-level any resources selected from the final selection of resource representations in the network environment are resources identified within the set of closure resources; and

re-selecting a final selection of resource representations in the network environment that represent resources to which a management action is to be applied.

24.   (Original) The computer system of claim 22 wherein the management application is a storage management application and the management action is deallocation of resources that operate to store data under management of the management application.

25.   (Original) The computer system of claim 24 wherein:

objects representative of resources in the network environment in the repository are hierarchically arranged in an order and include host objects representing host resources and storage objects representing storage resources in allocated by the host resources and where the host objects are hierarchically above the storage objects in the hierarchically arranged order; and

wherein the selected resource representation corresponds to a host object resources; and

wherein when the resource manager performs the operation of applying the going down function, the resource manager performs the operation of:

traversing operational relationships of host objects, beginning at the selected resource host object in the repository, to identify successive host and storage objects linked in an operational path ending at at least one storage object that is a storage device, the going down function thus identifying each host and storage resource allocated for use during access to data in the storage device object by the selected host object resource.

26.   (Original) The computer system of claim 25 wherein when the resource manager performs the operation of applying the going up function, the resource manager performs the operation of:

identifying host objects in the repository that are:

i) operationally linked to each host and storage object identified during application of the going down function but in a direction upwards in the hierarchically arranged order of objects in the repository; and

ii) that are not directly within the data flow path identified in the going down function from the selected resource host object to the storage device object, the going up function thus identifying additional objects representing resources in the network environment that may be affected by the management action upon the selected resource.

27.   (Original) The computer system of claim 26 wherein when the resource manager performs the operation of applying the closure function, the resource manager performs the operation of:

identifying closure objects in the repository by repeatedly re-applying an operation of the going down function and going up function to the additional objects representing resources in the network environment that may be affected by the management action upon the selected resource that were identified during operation of the going up function.

28.   (Original) The computer system of claim 27 wherein hierarchically arranged host objects include a top-level host computer system, a database, a file system, a volume group, a logical volume, a multipath device, a host interface device, a host port; and

wherein hierarchically arranged storage objects include a lowest-level storage device, a storage adapter, and a storage port.

29.   (Currently Amended) A computer program product having a computer-readable medium including computer program logic encoded thereon that, when executed on a computer system provides a method for applying a management action to a resource in a network by causing the computer system to perform the operations of:

receiving a selection of a resource representation in a network environment that represents a resource to which a management action is to be applied;

applying a series of resource traversal functions to a repository containing objects representative of network resources in the network environment, the traversal functions identifying a set of action affected resources in the network environment existing along a set of relationship paths extending to at least one storage device that have a current allocation relationship to the selected resource, by:

applying a going down function to the repository containing objects representative of resources to identify a set of downward resources in the network environment that have a downward allocation relationship to the selected resource, the downward allocation relationship indicating resources that

the selected resource depends upon and that are in operational use during access to data by the selected resource on a downward allocation path beginning at the selected resource and extending downward through the network environment and terminating at physical storage devices that store the data accessed by the selected resource, by:

identifying existence of a set of replicated resources in the set of downward resources, the set of replicated resources including a replicated instance of a detected replicated resource and any resources operationally related to the replicated instance of the detected replicated resource; and

presenting a representation of the set of action affected resources in the network environment to a user of the management application, the representation of the set of action affected resources informing the user of resources within the storage area network that are currently in an functional relationship with the selected resource to which a management action is to be applied and that may be affected if the management action is to be applied to the selected resource.

30. (Previously Presented) The method of claim 1 wherein applying comprises:

applying a series of resource traversal functions to a repository containing objects representative of network resources in the network environment, the objects arranged in a resource hierarchy representative of the actual hierarchy of the network resources in the network environment, wherein a connection between two resources in the resource hierarchy is a relationship indicator path, the resource traversal functions navigating up and down the hierarchy along relationship indicator paths to identify a set of action affected resources, the action affected resources including resources connected to the selected resource along one or more relationship indicator paths.

31. (Previously Presented) The method of claim 1 wherein presenting comprises:

presenting a representation of the set of action affected resources in the network environment to a user of the management application independent of a location of an

action affected resource in a level of a hierarchy of the resources, the representation
informing the user of those resources in the storage area network related to the
selected resource and that may be affected if the user chooses to apply the
management action to the selected resource.

32. (Previously Presented) The method of claim 1 wherein applying comprises:

applying a series of resource traversal functions to a repository containing
objects representative of network resources in the network environment, the traversal
functions identifying a set of action affected resources in the network environment
existing along a set of relationship paths extending to at least one storage device that
have a current allocation relationship to the selected resource, the set of action affected
resources identified without applying a management action to the selected resource;
and wherein presenting comprises:

presenting a representation of the set of action affected resources in the network
environment to a user of the management application, the representation of the set of
action affected resources informing the user of resources within the storage area
network that are currently in an functional relationship with the selected resource to and
that may be affected when the management action is applied to the selected resource.

33. (Previously Presented) The method of claim 1 comprising:

prior to applying a series of resource traversal functions:

receiving a management action to be applied to the selected resource;
and

delaying application of the received action to the selected resource until a
delay condition is satisfied.

34. (Previously Presented) The method of claim 33 comprising:

receiving a final selection of a resource representation in the network
environment, the final selection comprising at least one of the presented action affected
resources, the receipt of the final selection of the resource representation and the

presentation of the representation of the set of action affected resources satisfying the delay condition; and

applying the received management action to the final selection of the resource representation.

35. (Previously Presented) The method of claim 34 wherein receiving a final selection comprises:

automatically adding an action affected resource identified by the resource traversal functions to a final selection of resource representations in the network environment, the receipt of the final selection of resource representations and the presentation of the representation of the set of action affected resources satisfying the delay condition.